What is claimed is;

1.   A print medium quality adjustment system comprising:

an inspection watermark medium output device that outputs an inspection watermark medium to be used to inspect a print medium and a watermark quality inspection device that inspects the quality of a watermark in the print medium, wherein:

the inspection watermark medium output device includes an inspection watermark signal generation unit that generates a single inspection watermark signal or a plurality of inspection watermark signals to be used for inspection, generates a watermark signal image by disposing the watermark signal(s) in an arbitrary arrangement and generates inspection training data having digitally recorded therein the inspection watermark signal(s); and

an inspection medium output unit that outputs an inspection watermark medium to be used for inspection created by printing an inspection watermark image onto a medium; and

the watermark quality inspection device includes:

an input unit that takes in the inspection watermark medium as a multi-value gradation input image;

a signal detection unit that detects a signal embedded in the input image and extracts embedded watermark information;

a print quality judgment unit that judges watermark quality by comparing the watermark information with the inspection training data input thereto; and

a print adjustment value output unit that outputs, based upon the results of the quality judgment, a print adjustment value to be used to improve the print quality.

2.   A print medium quality adjustment system according to claim 1, further comprising:

an adjusted watermark medium output device that outputs an adjusted print medium based upon the print adjustment value input thereto, wherein:

the adjusted watermark medium output device includes;

a document image generation unit that creates a document image printed on a medium based upon document data;

a watermark information generation unit that N-dimensionally (N is a value equal to or greater than 2) encodes data indicating a numerical value, which are obtained by digitizing embed information to the embedded in a medium as a watermark signal;

a print adjustment value input unit to which the print adjustment value is input; ·

an adjusted watermark image generation unit that generates a watermark image based upon the document image and the watermark information by using the print adjustment value; and

a medium output unit that outputs an adjusted watermark medium created by printing the watermark image onto a medium.

3.   A print medium quality adjustment system according to claim 1, wherein:

the print adjustment value output unit determines an adjustment value, which is dependent on the position assumed at the print medium, in correspondence to the difference between the inspection training data and the watermark signal detected by the signal detection unit and then output the adjustment value thus determined as the print adjustment value.

4.   A print medium quality adjustment system according to claim 3, wherein:

the inspection training data are obtained by using at least part of the watermark information.

5.   A print medium quality adjustment system according to claim 4, wherein:

the print quality judgment unit divides adjustment values, each determined in correspondence to a specific position at the print medium, into groups each representing one of an arbitrary number of areas, sets an area with an adjustment value equal to or greater than a predetermined threshold value as a high-error area and designates the high-error area as a dummy watermark area with no information contained therein.

6.   A print medium quality adjustment system according to claim 4, wherein:

the inspection watermark medium output device generates a plurality of inspection watermark signals; and

the print adjustment value output unit determines the print medium position-dependent adjustment value by executing tabulation processing on the plurality of inspection watermark signals.

7.   A print medium quality adjustment system according to claim 3, wherein:

the adjusted watermark medium output device is connected with the inspection watermark medium output device and the watermark quality inspection device so as to receive at least the watermark image via the network.

8.   A print medium quality adjustment system according to claim 7, wherein:

the adjusted watermark medium output device also receives the print adjustment value via the network.

9.   A print medium quality adjustment system according to claim 1, wherein:

the inspection watermark signal generation unit embeds characteristics information indicating document image characteristics needed for tampering detection processing as the inspection watermark.

10.   A print medium quality adjustment system according to claim 2, wherein:

the print adjustment value output unit outputs as the print adjustment value a watermark printing parameter that satisfies a predetermined allowable recognition error rate by adopting a character recognition technology.

11.   A print medium quality adjustment system according to claim 1, wherein:

the inspection watermark signal includes a plurality of signals different from one another provided to express identical information.

12.   A print medium quality adjustment system according to claim 1, wherein:

a printing parameter of the inspection watermark signal is determined based upon a change in the print density value for the watermark signal image.

13.   A print medium quality adjustment system according to claim 1, wherein:

a printing parameter of the inspection watermark signal is determined based upon a change in the arrangement of pixels constituting the watermark signal image.

14.   An inspection watermark medium output device that outputs an inspection watermark medium to be used to inspect a print medium, comprising:

an inspection watermark signal generation unit that generates a single inspection watermark signal or a plurality of inspection watermark signals, generates a watermark signal image by disposing the inspection watermark signal(s) in an arbitrary arrangement and generates inspection training data having digitally recorded therein the inspection watermark signal(s); and

an inspection medium output unit that outputs an inspection watermark medium by printing the inspection watermark image on a medium.

15.   An inspection watermark medium output device according to claim 14, further comprising:

a watermark medium compression unit that compresses the inspection watermark medium.

16.   An inspection watermark medium output device according to claim 14, wherein:

the inspection watermark signal generation unit embeds characteristics information indicating document image characteristics needed for tampering detection processing in the inspection watermark.

17.   An inspection watermark medium output device according to claim 14, wherein:

the inspection watermark signal includes a plurality of signals different from one another provided to express identical information.

18. An inspection watermark medium output device according to claim 14, wherein:

a printing parameter of the inspection watermark signal is determined based upon a change in the print density value for the watermark signal image.

19. An inspection watermark medium output device according to claim 14, wherein:

a printing parameter of the inspection watermark signal is determined based upon a change in the arrangement of pixels constituting the watermark signal image.

20. A watermark quality inspection device that inspects a watermark quality of a watermark in a print medium by using an inspection watermark medium and inspection training data input thereto, comprising:

an input unit that takes in the inspection watermark medium as a multi-value gradation input image;

a signal detection unit that detects a signal embedded in the input image and extracts embedded watermark information;

a print quality judgment unit that judges the watermark quality by comparing the watermark information with the inspection training data input thereto; and

a print adjustment value output unit that outputs, based upon the results of the quality judgment, a print adjustment value to be used to improve the print quality.

21. A watermark quality inspection device according to claim 20, wherein:

the print adjustment value output unit determines an adjustment value, which is dependent on the position assumed at the print medium, in correspondence to the difference between the inspection training data and the watermark signal detected by the signal detection unit and then output the adjustment value thus determined as the print adjustment value.

22. A watermark quality inspection device according to claim 21, wherein:

the inspection training data are obtained by using at least part of the watermark information.

23. A watermark quality inspection device according to claim 21, wherein:

the print quality judgment unit divides adjustment values, each determined in correspondence to a specific position at the print medium, into groups each representing one of an arbitrary number of areas, sets an area with an adjustment value equal to or greater than a predetermined threshold value as a high-error area and designates the high-error area as a dummy watermark area with no information contained therein.

24. A watermark quality inspection device according to claim 21, wherein:

the inspection watermark medium output device generates a plurality of inspection watermark signals; and

the print adjustment value output unit determines the print medium position-dependent adjustment value by executing tabulation processing on the plurality of inspection watermark signals.

25.   A watermark quality inspection device according to claim 20, wherein:

the print adjustment value output unit outputs as the print adjustment value a watermark printing parameter that satisfies a predetermined allowable recognition error rate by adopting a character recognition technology.

26.   An adjusted watermark medium output device that outputs an adjusted print medium based upon a print adjustment value input thereto, comprising:

a document image generation unit that creates a document image printed on a medium based upon document data;

a watermark information generation unit that N-dimensionally (N is a value equal to or greater than 2) encodes data indicating a numerical value, which are obtained by digitizing embed information to be embedded in a medium as a watermark signal;

a print adjustment value input unit to which the print adjustment value is input;

an adjusted watermark image generation unit that generates a watermark image based upon the document image and the watermark information by using the print adjustment value; and

a medium output unit that outputs an adjusted watermark medium created by printing the watermark image onto a medium.

27.   An inspection watermark medium used to inspect a print medium, created by:

generating a single inspection watermark signal or a plurality of inspection watermark signals, disposing the inspection watermark signal(s) in an arbitrary arrangement so as to generate a watermark signal image and printing the inspection watermark image onto a medium.

28. An inspection watermark medium according to claim 27, wherein:
the inspection watermark signal includes a plurality of signals different from one another provided to express identical information.

29. An inspection watermark medium according to claim 27, wherein:
a printing parameter of the inspection watermark signal is determined based upon a change in the print density value for the watermark signal image.

30. An inspection watermark medium according to claim 27, wherein:
a printing parameter of the inspection watermark signal is determined based upon a change in the arrangement of pixels constituting the watermark signal image.

31. An inspection watermark medium output device that outputs an inspection watermark medium to be used to inspect a print medium, comprising:
an inspection pattern input unit to which a plurality of inspection patterns are input;
an inspection parameter input unit to which an inspection parameter is input;
an inspection watermark medium design unit that disposes the inspection patterns on an inspection watermark medium; and

an inspection watermark medium output unit that outputs the inspection watermark medium having been designed by the inspection watermark medium design unit, wherein:

the inspection watermark medium design unit divides the area on the inspection watermark medium into a plurality of pattern areas, generates an inspection pattern group to be used for inspection based upon the inspection patterns and the inspection parameter and disposes an inspection pattern to be set for each pattern area in correspondence to a position thereof on the inspection watermark medium.

32.   An inspection watermark medium output device according to claim 31, wherein:

the inspection patterns include at least one of; a dot pattern, a density pattern, a line pattern, a character pattern and a gradation pattern.

33.   An inspection watermark medium output device according to claim 31, wherein:

the inspection watermark medium design unit designates patterns in the inspection pattern group to at least one sub pattern group, and dispose the individual sub pattern groups each at a separate inspection watermark medium.

34.   An inspection watermark medium output device according to claim 33, wherein:

the inspection watermark medium design unit disposes a single inspection pattern in a plurality of pattern areas different from one another, if the number of patterns in the sub-pattern group is smaller than the number of pattern areas at the inspection watermark medium.

35.   An inspection watermark medium output device according to claim 31, wherein:

the inspection watermark medium design unit calculates the number of inspection watermark media needed for an inspection based upon the inspection parameter input thereto and the size of an inspection sheet.

36.   An inspection watermark medium output device according to claim 35, wherein:

the inspection watermark medium design unit determines the number of inspection patterns to be used in the inspection based upon the inspection parameter and designates the result of a division operation executed by using the number of the number of areas present along the shorter side of the inspection sheet and the number of inspection patterns as the number of inspection watermark media.

37.   An inspection watermark medium output device according to claim 31, wherein:

the inspection watermark medium design unit divides the area on the inspection watermark medium into pattern areas forming a lattice, disposes a single type of inspection pattern at each coordinate point present along a side of the inspection watermark medium at least once and adjusts the coordinates of each inspection pattern along the direction separating the side from the opposite side so as to allow the inspection pattern to be disposed at each coordinate point along the direction separating the side from the opposite side at least once.

38.   An inspection watermark medium output device according to claim 37, wherein:

the coordinates of the inspection pattern are adjusted by generating an arithmetic sequence that includes terms each representing the coordinate assumed along the one side of the inspection watermark medium and determining the coordinate by using the arithmetic sequence and the number of areas present along the direction separating the side from the opposite side.

39.   An inspection watermark medium output device according to claim 37, wherein:

the common difference in the arithmetic sequence assumes a value determined in correspondence to the number of areas present along the direction separating the side from the opposite side.